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TRANSPORTATION RESEARCH TRANSEARCH

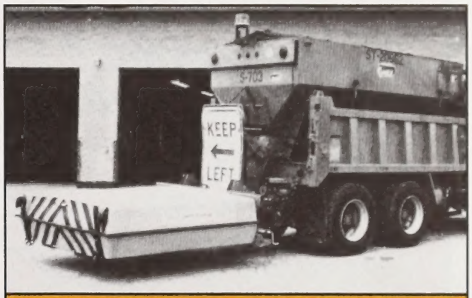
A RESEARCH AND DEVELOPMENT TECHNICAL PUBLICATION

SALT SPREADER TMA

The newly available Salt Spreader TMAs solve several problems simultaneously. Damage caused by rear-end collisions to salt trucks will be lessened considerably and dramatic savings in equipment and labor can be achieved.

Improved Safety: Winter-related accidents account for the largest number of accidents in the maintenance work zone. These accidents primarily involve rear-end collisions with slow-moving salt spreading and snow-removal trucks. On-road moving activities represent 34% of maintenance work zone accidents, but only 14% of the maintenance hours are spend on these activities. This illustrates that there is a disproportionately high number of serious accidents related to slow-moving maintenance activities. A new TMA Interface Structure, which allows increased use of TMAs during salt-spreading operations, can greatly reduce injuries and damage caused during such collisions.

Reduced Costs: The new TMAs also have a big impact on costs. Until now a separate "shadow vehicle" frequently had to be employed to carry the TMA. The new TMA permits the use of both a TMA and a salt spreader on the rear of the same truck. The support structure is a steel frame serving as an adapter between a salt truck with a center discharge-type spreader and commercially available Tams. All TMA support and hydraulic members are placed on either side of a center opening through which the salt spreader/spinner passes. When not in use, the TMA may be tilted up to a vertical position.



Truck-Mounted Attenuator (TMA)

SNOW FENCE GUIDE

Blowing snow is a maintenance engineer's nightmare. It blinds drivers, causes accidents, and makes clearing the road difficult - at times impossible. When the snow melts, runoff seeps under the pavement, where water can cause cracking and heaving.

Modern Snow Fence

A well-planned snow fence program can provide a solution to blowing snow problems, and can be an excellent long-tern investment.

The modern snow fence is a far cry from the 4-foot-high vertical slat fence so common 20 years ago. Placed in contact with the ground, the old-fashioned fence was an ineffective snow collector. Properly designed and placed, taller fences are dramatically more effective than the traditional low picket fence. New lightweight plastics now allow the construction of portable fences up to 8 feet tall.

To encourage more widespread use of this extremely cost-effective technology, SHRP developed a *Snow Fence Guide* that covers everything maintenance engineers need to know to design and locate snow fences correctly. The *Guide* summarizes the results of new research conducted by SHRP, as well as other research conducted over the last two decades. A 21-minute video, "Effective Snow Fences," supplements the *Guide*.

SPECIAL ISSUE – SHRP PRODUCTS

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EDITORIAL - SHRP PRODUCTS

This issue of TRANSEARCH is primarily dedicated to SHRP PRODUCTS. By now most readers are familiar with the C-SHRP and SHRP programs. Both programs are now quickly approaching the winding down stage, at least as far as the administration of research activities are concerned. Both programs are now gearing up for the dissemination of the numerous and varied products resulting from these large scale research efforts.

The Transportation Association of Canada (TAC) is hard at work planning how best to approach the task of effectively disseminating these results through out Canada at the national level. The Technology Transfer Section of R&D Branch is looking at the same challenge but at a provincial level. The dissemination efforts contemplated involve not only the department but also all road authorities through out the province. One of the key challenges facing R&D Branch will be the acquisition of the various products and their evaluation in practice, in the field as well as in the design offices.

A preliminary awareness campaign has been initiated by R&D Branch through the distribution to all Technology Transfer Representatives a video entitled "SHRP NOW EXHIBIT - 1991 AASHTO TECHNOLOGY TRANSFER FAIR" . This video highlights some fifty new and innovative products that have evolved from the SHRP program. A set of brochures containing specifications on these products have also been distributed along with the video.

Only twenty products are highlighted in this issue of TRANSEARCH. A full listing of products is located on the last page of this publication.

If you have any inquiries regarding any of these products contact your Tech Transfer Rep or R&D Branch at 422-2750.

About This Publication

The TRANSEARCH quarterly publication is prepared by the Research and Development Branch of Alberta Transportation and Utilities. The publication is dedicated to the effective transfer of transportation and utilities related research information and state-of-the-art technologies throughout the department. The opinions expressed in the articles in this publication are those of the authors and are not necessarily the official views of Alberta Transportation and Utilities.

In short news and feature articles, TRANSEARCH reports on the most interesting research and technologically significant events concerning the department.

In the interest of providing a vehicle for the effective transfer of technology throughout the department, Research and Development encourages department staff to provide proposals containing unique ideas, innovations or opportunities for research and evaluation which may provide solutions to the various technical needs of the department.

This publication is distributed throughout the department of Alberta Transportation and Utilities. Back issues are catalogued and retained in the department library. Copies of TRANSEARCH are also distributed to other Canadian D.O.T.s as well as Alberta Cities.

Comments and suggestions may be submitted to:

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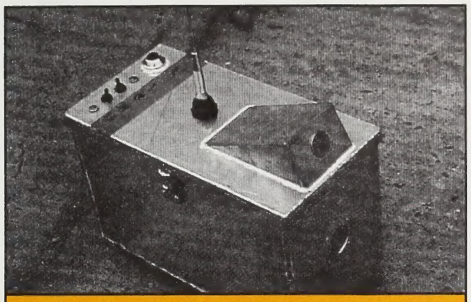
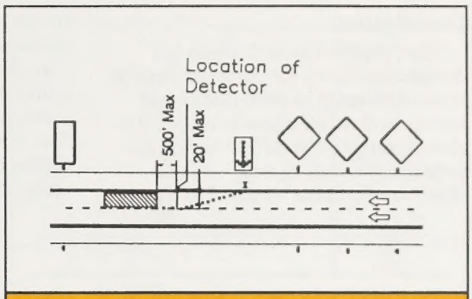
ULTRASONIC DETECTION ALARM

Description:

The Ultrasonic Detection Alarm is used to reduce the loss of life and injury to workers in the work zone by warning workers of errant vehicles. The alarm is comprised of two units - the detector and the siren unit. The ultrasonic detector is placed 500 feet from the siren unit. The siren unit is placed near the workers. When the detector senses a vehicle, a loud siren is activated. This alerts the workers to evacuate the work zone and get out of the way of the oncoming errant vehicle. This preliminary warning gives the workers between four and seven seconds to escape.



Ultrasonic Detection Alarm



Typical Application

Features:

- Detects errant vehicles
- Alerts workers of arrent vehicles
- Gives workers time to evacuate the danger area
- Lightweight
- Portable
- Easy setup
- Durable

Specifications:

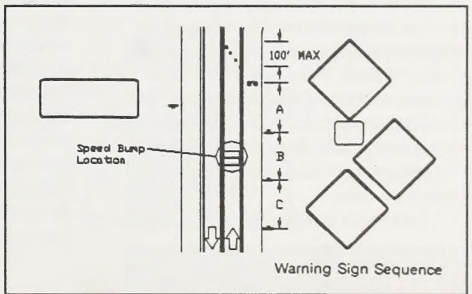
Maximum Range: 20 feet
Transmitter Range: 0.25 miles
Battery Life: 9 hours
Weight of Detector Unit: 28 pounds
Weight of Siren Unit: 16 pounds

PORTABLE SPEED BUMP

Description:

The Portable Speed Bump is a device designed to enhance the safety of flagging operations in highway construction and maintenance zones. It is a simple mat with a raised bar that is placed on the road to give drivers that pass over it a noticeable jolt along with an audible rumble effect. These two stimuli serve to alert the driver to the possibly hazardous conditions that may exist. Tests have shown that this device decreases vehicle speeds in work zones.

Portable Speed Bump



Warning Sign Sequence

Typical Application

Features:

- Protects flaggers
- Durable
- Lightweight and portable
- Produces significant speed decrease
- Stays on road without moving
- Inexpensive materials
- Simple construction
- Fast and easy installation and pickup

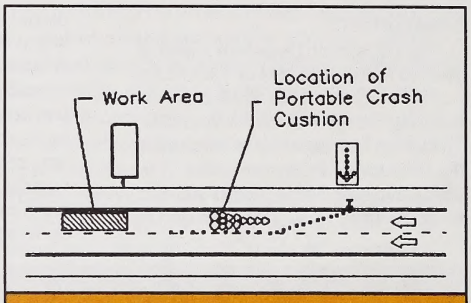
Specifications:

Width: 4 feet
Length: 12 feet
Weight: Approx. 60 pounds
Material: Mat - Neoprene Rubber
Bump - Raised Pavement Markers

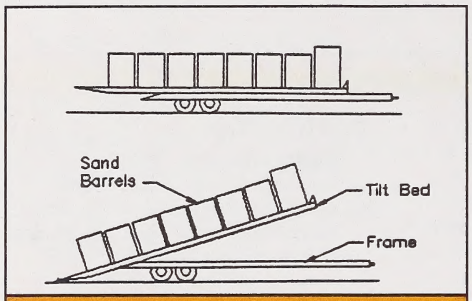
PORTABLE CRASH CUSHION

Description:

The Portable Crash Cushion is a device that allows for the rapid deployment of an array of sand-filled crash barrels to close off a lane of traffic. The device consists of a tilt-bed trailer, an articulated pallet, an array of sand-filled barrels, and a winch. The bed of the tilt trailer has been modified with rows of rollers that allows the articulated pallet to easily slide up and down the inclined plane. The winch enables controlled deployment and retrieval along the tilted trailer bed.



Typical Application



Crash Cushion Array

Features:

- Fast and easy deployment of an array of sand barrels
- One-person operation
- 12-ton load capacity
- Closes off a lane of traffic
- Barrels secured to pallet for safety
- Electric winch uses standard 12 volt power

Specifications:

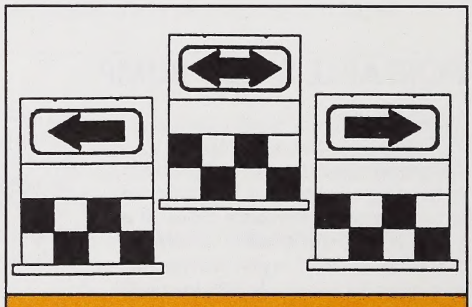
Overall Length: 37 feet 3 inches
Overall Width: 7 feet 8 inches
Pallet Length: 30 feet 4 inches
Pallet Width: 7 feet 1 inch
Sand-Filled Barrels: 13
Load Capacity: 12 tons

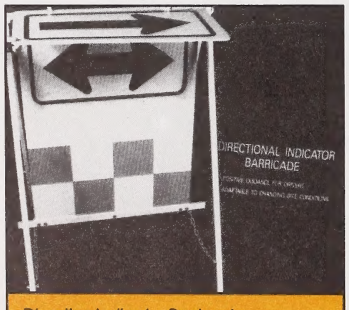
DIRECTION INDICATOR BARRICADE

Description:

The Direction Indicator Barricade modifies the current barricade by using an arrow to provide travel path information to the driver. The current diagonal striping, which indicates the path of travel, is replaced by a non-directional checkerboard pattern, and the directional information is conveyed by an arrow which appears as part of the center barricade panel on the appropriate side.

The benefit to the maintenance personnel comes from the flexibility of the device. A single barricade can be used for left side, right side, or center lane applications. This could reduce the number of barricades needed in the inventory. It may reduce the inappropriate use of barricades indicating the wrong direction of travel. This also permits barricades at a work site to be adopted to changing site conditions.


Typical Configurations



Direction Indicator Barricade

Features:

- Improves positive guidance for drivers
- Durable
- Lightweight and portable
- Inexpensive materials
- Simple construction
- Fast and easy installation and pick-up

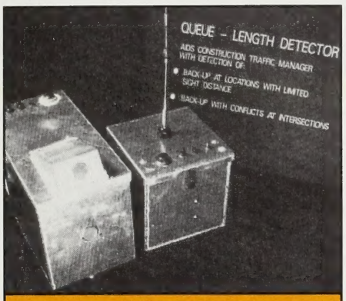
Specifications:

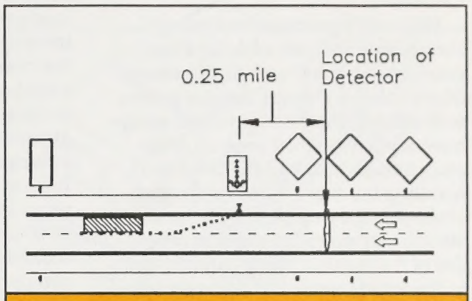
Height: 45 inches
Width: 26.5 inches
Weight: 20.5 pounds
Arrow Size: 17.5 inches
Color: orange, white and black

QUEUE-LENGTH DETECTOR

Description:

The Queue-Length Detector is used to detect a traffic backup, or queue. Once a queue is detected, a signal is sent to the supervisor of the work zone, indicating that some action needs to be taken to increase traffic flow. The Queue-Length Detector is essentially an ultrasonic device that senses vehicles with sound. When a vehicle enters the unit's window, a sound wave is reflected back. If this reflection continues for fifteen seconds then the unit transmits the alert to the supervisor.


QUEUE - LENGTH DETECTOR
AIDS CONSTRUCTION TRAFFIC MANAGER WITH DETECTION OF:
BACK-UP AT LOCATIONS WITH LIMITED SIGHT DISTANCE
BACK-UP WITH CONFLICTS AT INTERSECTIONS
Queue -Length Detector



Typical Application

Features:

- Detects queue conditions
- Alerts work zone supervisor
- Indicates that a change is needed to increase traffic flow
- Lightweight
- Portable
- Easy setup
- Durable

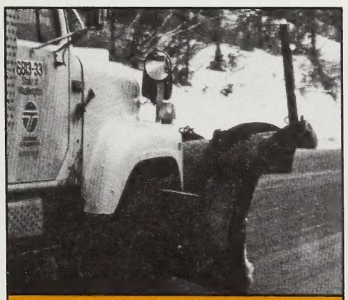
Specifications:

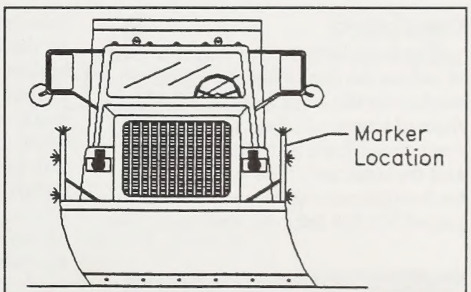
Maximum Range: 20 feet
Transmitter Range: 0.25 mile
Battery Life: 9 hours
Weight of Detector Unit: 28 pounds

SNOW PLOW BLADE MARKERS

Description:

The Snow Plow Blade Markers are a set of lights designed to be mounted at the ends of a snow plow blade to indicate the presence and extent of the blade. The markers consist of three lights mounted on rectangular steel channels. One assembly is mounted on each end of the plow blade. This will help drivers to avoid hitting the blade when passing the snow plow. It will also provide a visual cue to the snow plow operator as to the position of the blade. This will aid safe maneuvering of the plow on the highway and roadside by helping to avoid stationary objects.


Snow Plow Blade Markers



Typical Application

Features:

- Defines the limits of the blade for the driver of the snow plow
- Defines the limits of the blade for the oncoming driver
- Durable
- Weather-resistant

Specifications:

Light Bulb: Wheelan # A508
Light Fixture: Wheelan # A555-14
Voltage: 12 volts
Marker Height: 2 feet 6 inches
Marker Weight: Approx. 12 pounds each

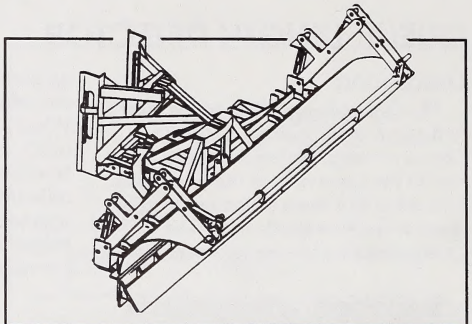
IMPROVED DISPLACEMENT PLOWS

Problem

Highway agencies spend many hundreds of millions of dollars each year clearing snow with displacement (blade) plows. Present designs are not very efficient; fuel is wasted and equipment life is shortened because of the extra forces impressed on the plow in handling the snow. Plow design has evolved largely empirically, with little attention given to the physical properties of the material being handled and to the aerodynamic and hydrodynamic principles involved in the flow of fluidized snow over various geometrical shapes. Snow varies in its fluid properties from feather-like to slurry-like. All existing displacement plow designs are compromises because their geometries cannot accommodate the broad range of snow properties and varied functional requirements such as controlled cast distance, reversible cast direction, and controlled discharge trajectory.

Research Approach

A computer simulation of flow over various geometries was made as an early step in the investigation. This identified the compaction of snow ahead of the advancing plow as causing the greatest energy waste and that mounting a wedge ("snow scoop") in front of the cutting edge provided a smooth unbroken flow of snow over the moldboard which minimizes compaction. This was confirmed in tests of a full-scale experimental plow which was constructed incorporating variable geometry shaping using flexible plastic sheet. Tests conducted during the winter of 1990-91 demonstrated a 20 percent reduction in force required to plow snow compared to a traditional highway plow. Improvements in the cutting edge tripping mechanism are also being investigated.



Improved Displacement Plow

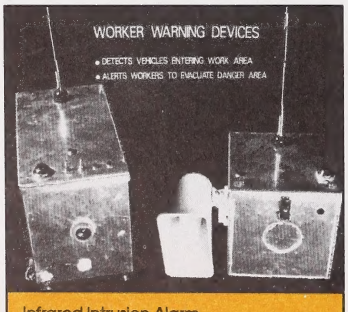
Products

Use of the experimental plow to obtain field data while plowing a wide range of snow types and depths will lead to design criteria for new, more efficient plows engineered to accomplish selected functions such as high-speed and low-speed long cast or high cast. The snow scoop design will be improved to obtain maximum life, and the designs for retrofit to existing plows will also be prepared. These design criteria and scoop designs are expected to be available by September 1992 for use by highway agencies and manufacturers.

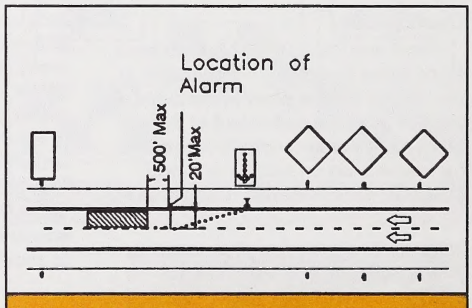
INFRARED INTRUSION ALARM

Description:

The Infrared Intrusion Alarm is used to reduce the loss of life and injury to workers in the work zone by warning them of errant vehicles. The alarm is comprised of two units, the detector and the siren unit. The infrared detector is of the retroreflective type and is placed 500 feet from the siren unit. The siren unit is placed near the workers. When the beam is broken, a loud siren is activated. This alerts the workers to evacuate the work zone and get out of the way of the oncoming errant vehicle. This preliminary warning gives the workers between four and seven seconds to escape.



Infrared Intrusion Alarm



Typical Application

Features:

- Detects errant vehicles
- Alerts workers of errent vehicles
- Gives workers time to evacuate the danger area
- Lightweight
- Portable
- Easy setup
- Durable

Specifications:

Maximum Range: 20 feet
Transmitter Range: 0.25 miles
Battery Life: 9 hours
Weight of Detector Unit: 28 pounds
Weight of Siren Unit: 16 pounds

FABRICATION AND TESTING OF AUTOMATED MAINTENANCE EQUIPMENT FOR CRACK REPAIR

The Problem

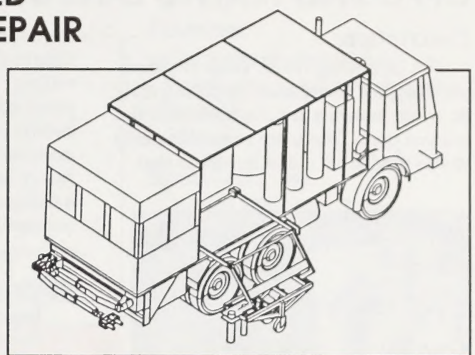
The sealing and filling of cracks are tedious, labor intensive operations. A typical operations to seal transverse cracks in asphalt concrete requires a crew of eight, which can seal from one to two lane miles per day. The associated costs are approximately $1,800 per lane-mile with 66% attributed to labor, 22% to equipment and 12% to materials. In addition, the crack sealing work team is exposed to a great deal of danger from moving traffic.

The Solution

The ultimate goal of the SHRP is to develop prototype automated machinery that will sense, prepare, and seal (or fill) cracks and joints in pavements. The primary objective of this project is to design machinery for the sealing and filling of joints and cracks in pavement in order to: increase the cost-effectiveness of these operations; the quality, consistency, and life of the resultant seals and fills; and to improve the safety of workers and highway users by using remote operation and control of equipment.

How Will It Work?

The simpler longitudinal crack sealing apparatus is mounted on the side of the vehicle platform (see Figure) and primarily seals the cracks and joints in pavement found at the edges of the lane. The tool cart houses a local vision sensor, router/debris remover, heater/cleaner, and sealant head. Lateral motion of the cart is controlled hydraulically via communication with the local vision sensor.



Automated Crack Repair Unit

General cracks are sealed by a pair of robots mounted on linear slides located at the rear of the vehicle. These slides carry two tool carts that perform automated sensing, preparation, and sealing operations similar to those described above for the longitudinal apparatus.

The first tool cart will house the local sensor that verifies the presence of a crack. Also, a router and debris removal device will be located on this cart. This will allow those states and DOTs that rout to do so while picking up the debris.

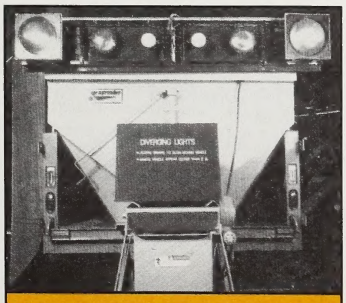
The second tool cart houses a high volume liquid propane gas heater. The sealant unit is the final device on the system. The hot pour bituminous sealant is dispensed onto the roadway and squeegeed into the necessary surface profile. Currently, the machine concept and components are in the design and testing phases of development.

The machine is fully modular and will allow various DOTs the ability to determine what sealing method works best for them, be it routing and heating, routing and cleaning, cleaning alone, or just sealing.

DIVERGING LIGHTS

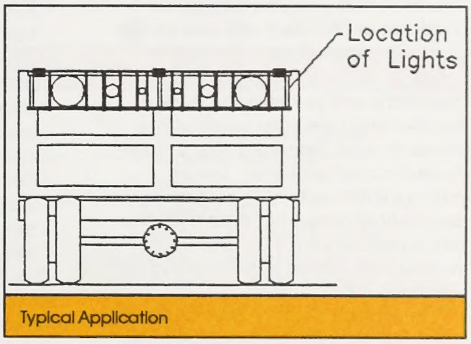
Description:

The Diverging Lights is a horizontal array of six lamps mounted on a panel to the rear of slow-moving maintenance vehicles. The lamps increase in size as they go from the center to the outer edge of the mounting panel. The lamps flash in sequence from the centre outward to give an illusion of changing depth of perception.



Diverging Lights

The Diverging Lights are designed to improve a driver's judgement of the speed of a slow-moving maintenance vehicle and the closing speed. It does this by creating the illusion that the driver is closing in on the maintenance vehicle faster than the actual closing rate. As a consequence, it is hoped drivers will take corrective action soon enough to prevent running into the rear of the maintenance vehicle.



Typical Application

Features:

- Alerts drivers to the presence of maintenance vehicle
- Causes drivers to slow earlier
- Easy setup
- Durable

Specifications:

Length: 8 feet
Height: 14 inches
Voltage: 12 volts
Weight: 100 pounds

OPPOSING TRAFFIC LANE DIVIDERS

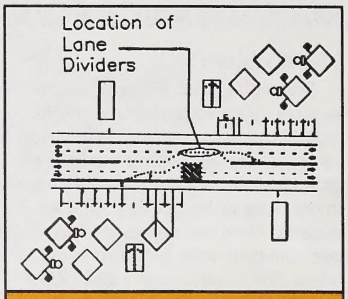
Description:

The Opposing Traffic Lane Dividers are designed to separate opposing traffic when patterns are changed from the normal path. There are several benefits to this device. A major benefit is that the delineator array will be less susceptible to disturbance in an operational setting. If hit by an automobile, the panel section is collapsible, and so avoids being damage or knocked out of position after being run over. The heavy base will minimize movement in a collision, and it makes the device less susceptible to wind gusts.

Opposing Traffic Lane Divider

Features:

- Improves positive guidance for drivers
- Durable
- Lightweight and portable
- Inexpensive materials
- Simple construction
- Fast and easy installation



Typical Application

Specifications:

Height: 19 inches
Width: 12 inches
Weight: 7.1 pounds
Arrow Size: 13 inches
Colors: orange and black

ROAD WEATHER INFORMATION SYSTEMS

Description

Road weather information systems (RWIS) incorporate technologies that can save highway agencies an estimated 10 percent of their annual snow and ice control costs. More precise knowledge of pavement surface state condition and of weather conditions over the first 6-18 hours can eliminate unnecessary call-outs and indicate the most effective strategy to employ. These technologies include atmospheric and pavement sensors, weather and pavement conditions forecasts, road thermography, and improved communications. Use of modern RWIS technologies is critical to establishing proactive rather than reactive snow and ice control procedures. A minimum system is estimated to cost about $30,000.

Three manuals are in preparation to assist highway maintenance organizations in implementing RWIS in support of snow and ice control. They provide guidelines for procuring and installing sensor systems, for establishing effective and rapid communications to obtain road condition and weather data and forecasts, and for applying this information into operational decisions. All three manuals are expected to be available as of January 1992.

Features

The "Guidelines for Utilizing RWIS Technology" manual provides advice on the implementation of RWIS technologies. Subjects covered include:

- Request for Proposal (RFP) preparation for procurement of RWIS sensor packages;
- RFP preparation for expert local road weather forecasting services;
- Types of RWIS information to use in snow and ice control decisions, including road thermography, weather and pavement conditions, and weather and pavement condition forecasts;
- integrating the information into managing snow and ice control operations.

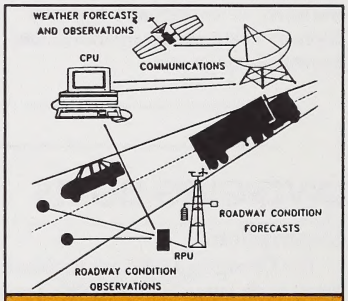
The "Guidelines for Locating and Placing RWISs" manual provides direction for deploying RWIS meteorological and pavement sensors. The manual considers:

- Where RWIS sensors should be located along the roadway;
- How RWIS sensors are installed in the road environment;
- How site requirements are determined.

The "Guidelines for RWIS Communications" manual provides recommendations for developing a RWIS communications strategy.

- Identifies RWIS communications requirements, including voice and data
- Describes communication modes
- Proposes a standard protocol for RWIS communication
- Proposes a standard format for RWIS data
- Suggests a model for highway agency RWIS communications

All three manuals were released in January 1992.



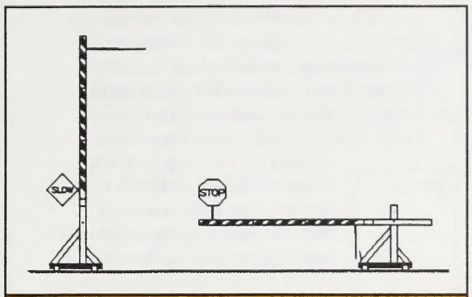
Weather Information System

FLAGGER GATE

Description:

The Flagger Gate replaces the flagger using a paddle or flag with a manually operated gate. Since the gate operator is positioned on the shoulder of the road, there is less risk than in typical flagger positions. When on the closed lane, the flagger is closer to the travelled way.

The Flagger Gate has a "Stop" and "Slow" view. When the arm is down a "Stop" is rotated into view. As the gate is raised to "Stop" sign rotates out of view and a "Slow" sign rotates into view.



Typical Application

Features:

- Conveys a clear message
- Puts the flagger in a safer position
- Durable
- Effective

Specifications:

Height With Arm Down: 3 ft. 8.5 in.
Width With Arm Down: 17 ft. 6 in.
Height With Arm Up: 17 ft. 8 in.
Width With Arm Up: 4 ft.
Total Weight: 250 pounds
Size of Stop Sign: 2 feet
Size of Slow Sign: 2 feet

THE SURFACE ANALYZER

The surface analyzer will help the maintenance engineer to determine objectively and precisely when to apply a preventative maintenance treatment and which treatment is appropriate. The device has distinct advantages over currently available measuring devices for the achievement of cost-effective maintenance management:

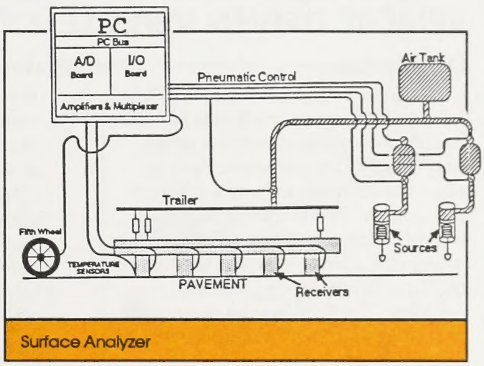
- It is so sensitive that the contributing factors to a potential distress can be measured in the very early stages;
- Overall measurements are so accurate and comprehensive that the pavement layer contributing to a potential distress can be identified;
- The precision of the measurements will enable the effectiveness of preventive maintenance treatments to be verified.

Description

A schematic of the surface analyzer is shown in the figure. The operating principle is based upon the generation and detection of stress waves in a layered medium. Several seismic testing techniques are combined. These seismic methods are:

- ultrasonic body waves;
- ultrasonic surfaces waves;
- impulse response;
- impact echo; and
- spectral analysis of surface waves (SASW).

The source-receiver configuration consists of a high-frequency (up to 50 kHz) and a low-frequency (up to 1 kHz) pneumatic source retrofitted with load cells, five high-output, high frequency accelerometers and three velocity transducers. The member upon which the equipment is mounted is supported by a lightweight trailer which can be towed behind a car or truck. The transducer mounting member can be pneumatically lowered for operation of the device and raised for travelling between measurement locations. To maximize efficiency, accuracy and simplicity the device is operated through well defined graphical menus using a portable computer from the drivers seat of the towing vehicle.



Surface Analyzer

What is Measured

From the measurements made with the device, five precursors of distress may be identified and diagnosed. They are:

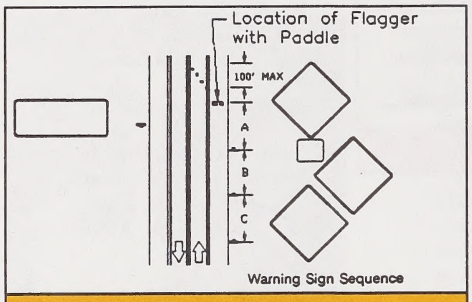
- Moisture in the base layer of a flexible pavement;
- Voids or loss of support under the joints of a rigid pavement;
- Overlay delamination;
- Fine cracking; and
- Asphalt aging.

Analytical software is being developed to reveal the state of a specific defect within a section of pavement to help the maintenance engineer to specify and prioritize the appropriate preventive maintenance treatment. A "stitch in time" can prevent premature, costly rehabilitation. By using this device, highway agencies can maximize the benefits of maintenance expenditures by determining optimum economic intervention levels for preventive maintenance.

FLASHING STOP/SLOW PADDLE

Description:

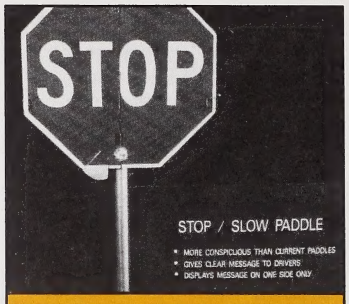
The Flashing Stop/Slow Paddle is used to alert the driver to hazards and the need to take some action. The paddle uses two high-intensity quartz halogen lamps, flashing alternately to attract a motorist's attention to the flagger. With a single press of a button, the lamps flash 10 times, then the system automatically resets itself. The unit is powered by rechargeable batteries in order to keep the center of gravity low. High-intensity retroreflective sheeting is used on the stop face with fluorescent retroreflective sheeting on the slow face. For durability, light weight, and high strength, the paddle is constructed of anodized aluminum with stainless steel fasteners.



Typical Application

Features:

- More conspicuous than current Stop/Slow paddles
- Durable
- Lightweight


STOP
STOP / SLOW PADDLE
* MORE CONSPICUOUS THAN CURRENT PADDLES
* GIVES CLEAR MESSAGE TO DRIVERS
* DISPLAYS MESSAGE ON ONE SIDE ONLY
Flashing Stop/Slow Paddle

Specifications:

Height: 70 inches
Weight: 7 pounds
Stop Sign Size: 18 inches
Lamp Size: 1.375 inches
Lamp: 20 watts
Batteries: 10 "D" Nicads
Voltage: 12 volts

REMOTE DRIVEN VEHICLE

Description:

The Remote Driven Vehicle (RDV) is a Ford L8000 dump truck that has been modified for radio-controlled operation. The RDV's intended role is to eliminate the need to have a driver in the shadow vehicle during highway maintenance operations. This prevents drivers from being exposed to rear-end collisions while driving shadow vehicles. The RDV system is completely fault-tolerant with multiple levels of safety systems.

Typical Application:

During a highway maintenance operation, such as pothole repair, the shadow vehicle would be placed upstream of the work crew. From this position, the RDV operator could move the truck forward as required.

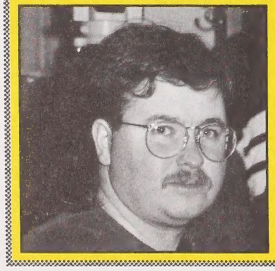
Features:

- Reduces the hazard to shadow vehicle drivers
- Simple operation via portable control box
- Controls all vehicle functions such as steering, throttle, and brakes, as well as auxiliary functions
- All weather operation
- Ultrasonic collision sensors
- Fail-safe operation
- Adaptable to other vehicles
- Computer controlled and monitored
- Modest maintenance requirements

Remote Driven Vehicle

Specifications:

Range: 1200 feet between truck and transmitter
Maximum Speed: 5 miles per hour
Collision Sensor
Distance: 10 feet
Battery Life: 1 week
Transmitter Weight: 4 pounds



1991 R&D TECH TRANSFER WORKSHOP PRESENTATION WINNER

Mr. Scott Parker of District 4 has been awarded the "1991 R&D WORKSHOP BEST PRESENTATION" award for his technical presentation dealing with practicle application of Total Station survey equipment. Scott gave this presentation at the 1991 R&D Technology Transfer workshop held in Calgary in February, 1991. Over 80 AT&U staff attended this first of what is intended to be an annual forum designed to share information on innovations that have potential benefits to the department. Scott was presented this award retroactively at the 1992 workshop in Grande Prairie in Janaury, 1992. Congratulation Scott, and sorry you had to wait so long to receive your award.

AUTOMATED POTHOLE REPAIR SYSTEM

The Problem

There is probably nothing that aggravates highway users more and reduces their respect for a highway agency than a pothole. Worldwide, a tremendous amount of resources are expended annually repairing these hazardous and unsightly roadway conditions. Depending on whether the repair is hurriedly done using the throw-and-go technique as is normally done in cold weather, or doing it right using cut/dry/compact technique, the cost of repair can vary significantly, anywhere from $10 to $30 per hole. The life of a patch, likewise, can vary from a few weeks for throw-and-go type repair, to several months using the cut/dry/compact procedure.

The Solution

The ultimate goal of the SHRP is to develop a prototype automated machine that will characterize and measure the pothole, clean and cut out the edges, clean out the hole, and fill the hole. The automated equipment will:

- increase the cost-effectiveness of the operation;
- increase the quality, consistency and life of the resultant patch; and
- increase the safety of workers and motorists.

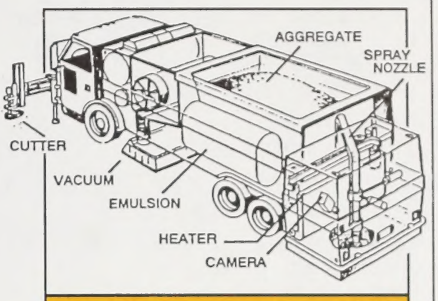
How Will It Work?

The automated pothole repair system is being developed by BIRL, Northwestern University's industrial research laboratories. It relies heavily on commercial components to provide the utmost in reliability and also to increase the likelihood that commercial versions are built. The single vehicle will cut the asphalt pavement, vacuum the hole without spraying debris into adjacent lanes, heat the pothole surface to an acceptable temperature (no open flames), and automatically fill the hole to a level surface.

How Much Will It Cost?

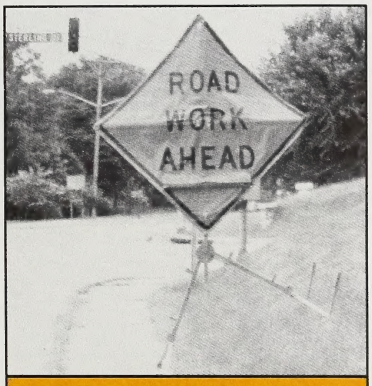
An automated pothole repair system is a major investment that can offer a substantial cost savings in labor and materials. In addition, this system will improve work crew safety, reduce traffic disruptions, and provide higher quality maintenance of pavement.

The vehicle platform and equipment costs of this automated system are estimated at $200,000 to $250,000. The annual operational expenses are expected to be similar to that of highway equipment such as motor graders or paint strippers.



Auto Pothole Repair Unit

PORTABLE SIGN AND STAND



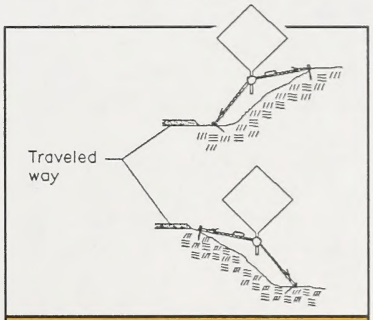
Portable Sign and Stand

Description:

The Portable Sign and Stand is a portable, adjustable sign and stand for 48-inch neoprene signs. This sign and stand can withstand gusty winds and can be used on cut and fill slopes. The legs on the sign and stand are adjustable, allowing use on uneven terrain. The feet can be staked down on severe slopes. The sign and stand fold to compact size for transport and storage.

Features:

- Improved wind resistance
- Better sign placement on uneven terrain
- Durable
- Lightweight and portable



Typical Application

Specifications:

Height: 5 feet
Sign Size: 48 inches

1992 R&D TECH TRANSFER WORKSHOP PRESENTATION WINNER

Mr. Darrell Quist, Assistant District Transportation Engineer in District 15 (High Level) was awarded the "1992 R&D WORKSHOP BEST PRESENTATION" award for his technical presentation on Grader Gates at the annual R&D Workshop held in Grande Prairie in January, 1992. Grader gates are modifications to regular snow plow blades that allow the grader operater to prevent snow windrow accumulation at residential driveways and farm entrances. This innovative idea was spawned in District 15 and realized through the help of Equipment Supply and Services Branch. Darrell's presentation included a video detailing the mode of operation of this new piece of equipment. R&D Branch can be contacted for more information on the video. Congratulations Darrell for a great presentation of a great idea!

SHRP PRODUCTS BROCHURES

(Available From Technology Transfer Reps or R&D Branch):

Binder Specification

Universal Test System (for ACP)

Superphalt Software (ACP Mix Design & Specifications)

Aging Methods (ACP)

Superphalt Specification

Thermal Stress Restrained Specimen Test (TSRST)

Net Absorption Test (ACP Aggregate)

Binder Products I:
- Bending Beam Rheometer
- Dynamic Shear Rheometer
- Direct Tension Test

Binder Products II:
- High Temperature Visometer
- Pressure Aging Vessel
- Extract & Recover Apparatus

Curing Tables (Evaluation Of Concrete Thermal Effects)

Rapid Aggregate Durability Test

Detection Of Alkali-Silica Reactivity

Rapid Aggregate Reactivity Test

Packing Tables & Diagrams (Packing-Based Aggregate Proportioning)

High Performance Concrete

Hwycon: An Expert System For Concrete Durability

Assessment Of Bridge Condition

Detecting Deterioration In Asphalt-covered Bridge Decks

Measuring Corrosion Rate Of Steel In Concrete

Electrochemical Chloride Removal & Protection Of Concrete Bridge Components

Effectiveness Of Penetrating Concrete Sealers: Electrical Resistance Method

Methodology For Protection & Rehabilitation Of Existing Reinforced Concrete Bridges

Surface-Air-Flow Permeability Indicator

Concrete Bridge Protection & Rehabilitation: Physical & Chemical Techniques

Photographic Distress Surveys

SHRP LTPP Guide - Laboratory Handling & Testing

SHRP LTPP Guide - Field Materials Sampling & Handling

Resilient Modulus Test Procedures For AC Pavement & Soul Samples

SHRP Deflection Testing Tools: Manual For FWD Testing

SHRP Deflection Testing Tools: FWD Quality Assurance Software

SHRP Deflection Testing Tools: FWD Calibration

SHRP Modified Georgia Digital Faultmeter

SHRP LTPP Manual For Profile Measurements

SHRP LTPP Profile Measurement Quality Assurance & Processing Software

SHRP-LTPP Information Management System

Fabrication Of Testing Of Maintenance Equipment Used For Pavement Surface Repairs

Handbook - Testing Methods For Evaluating Chemical Deicers

Innovative Materials Development & Testing (Crack Sealers & Pothole Repair)

Road Weather Information Systems

Network Level Maintenance Measurement Equipment: Subsurface Interface Radar

Project Level Maintenance Measuring Equipment: The Surface Analyzer

Pavement Maintenance Effectiveness

Automated Pothole Repair System

Improved Displacement Plows

Customized Weather Prediction For Highway Maintenance Operations

Direction Indicator Barricade

Infrared Intrusion Alarm

Ultrasonic Detection Alarm

Portable Crash Cushion

Opposing Traffic Lane Dividers

Queue-Length Detector

Portable Sign & Stand

Portable Speed Bump

Remote Driven Vehicle

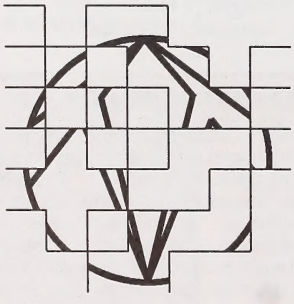
Flagger Gate

Diverging Lights

Flashing Stop\Slow Paddle

Snow Plow Blade Markers

The information regarding the products highlighted in this issue of TRANSEARCH was extracted from various SHRP publications with the permission of SHRP headquarters in Washington, D.C.



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